OccuSwitch DALI

User Manual

3222 636 49461
December 2013

This manual covers the following products:

LRM2070, LRM2072
LRM2080, LRM2082
LRM2090, LRM2092
LCU2070, LRH2070, LCC2070, LCC2080
It does NOT cover the LRM2095.

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1. Introduction to the OccuSwitch DALI

OccuSwitch DALI is a lighting dimming system for offices, schools, meeting rooms, storage rooms, restrooms and other indoor locations. The OccuSwitch DALI dimming system is a combination of daylight depending regulation, occupancy control and manual control. The system automatically turns the lighting in a room on and off based on occupancy. When enough daylight (natural light) enters the room, the system dims the luminaires (artificial lights).

OccuSwitch DALI is a combined sensor and controller. It has three main functional parts: a light sensor for daylight depending regulation, a movement detector for occupancy control and an infrared receiver for remote control.

The OccuSwitch DALI has options for local override, parallel operation and network links to Building Management Systems (BMS).

The specific Dynamic Lighting or SchoolVision functions (LRM209x) are not discussed in this manual.

Table 1: Main technical features

Feature	**Description**
Number of drivers per OccuSwitch DALI	Maximum of 15 drivers per OccuSwitch DALI. Maximum 2 extension but then with 13 drivers
Parallel linking	Maximum of 22 OccuSwitch DALI (Advanced) linked in parallel.
Detection area	Office area of 20-25 m² or a classroom area of approximately 48 m². Detection area optionally extended with an extension sensor.
Mounting	Optimized for recessed ceiling mounting and for mounting heights between 2.5 and 4 meter.
Application modes	10 available modes to suit different locations.
Building Management Systems (BMS)	Up to 64 OccuSwitch DALI LRM2090 devices can be linked to standard DALI interfaces.

2. Operating principle

2.1. OccuSwitch DALI versions

The following products are available for the OccuSwitch DALI lighting dimming system:

Table 2: OccuSwitch DALI products

OccuSwitch DALI product	Description
LRM2070 OccuSwitch DALI Basic	Standalone system with 2 DALI output connectors for window and corridor installation.
LRM2072 OSD basic NB	Exactly like LRM2070 but without Philips logo on the front plate
LRM2080 OccuSwitch DALI Advanced	Standalone system with 2 DALI output connectors. One connector is programmable for the luminaires. The other connector forms a parallel link to up to 22 different OccuSwitch DALI systems.
LRM2082 OSD advanced NB	Exactly like LRM2080 but without Philips logo on the front plate
LRM2090 OccuSwitch DALI BMS	Standalone system with 1 DALI input and 1 DALI output connector. One connector is programmable for the luminaires. The other connector contains a standard DALI interface for connecting to a BMS system, not specifically covered in this manual.
LRM2092 OSD BMS NB	Exactly like LRM2090 but without Philips logo on the front plate, not specifically covered in this manual.
LRM2095 OSD DL	Dynamic Lighting version, not specifically covered in this manual.

The following accessories are available for the OccuSwitch DALI lighting dimming system:

Table 3: OccuSwitch DALI accessories

	OccuSwitch DALI accessory	Description
	LRM8118 extension movement sensor	The LRM8118 can extend the movement detection area of OccuSwitch DALI: it has the same detection area size as the OccuSwitch DALI. The sensor is connected to the same DALI channel as the luminaires, and does not require mains power.
	LCC2070 standard Wieland cable	Cable for OccuSwitch DALI Basic systems LRM2070.
	LCC2080 standard Wieland cable	Cable for OccuSwitch DALI Advanced systems LRM2080 and OccuSwitch DALI BMS systems LRM2090.
	LRH2070 surface mounted box	Box for mounting the OccuSwitch DALI system (all types) onto the ceiling. The box is equipped with mounting holes for standard BESA boxes and socket plates.
	IRT9090 extended IR programming and commissioning tool	Tool capable of full commissioning. Batteries included.
	IRT8010 two-key remote control	Infrared single-channel switch, for the OccuSwitch DALI system. A wall holder is separately available. Batteries are included.
	LRH8010 wall holder	Holder for remote control IRT8010.
	IRT8050 two-key remote control	Wall-mounted or tabletop infrared control of the OccuSwitch DALI system. Can be configured for luminaire group control. Batteries are included.
	LCU2070 OSD PBU	Push button interface for OSD
	LCU2071 OSD PBU	Push button interface for OSD (LRM2095 only)

	IR remote control (1 or 2 channels). Batteries are included
UID8510	

2.1.1. OccuSwitch DALI Basic

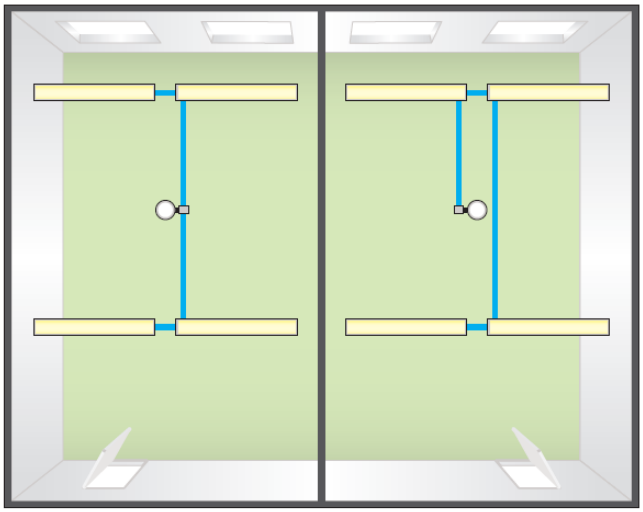


Figure 1: Two cell offices with OccuSwitch DALI Basic installations

The OccuSwitch DALI Basic is a module with 2 DALI output connectors, for window and corridor installation. The OccuSwitch DALI Basic is ideal for separate cell offices. Depending on commissioning and the number of output connectors in use, the OccuSwitch DALI Basic functions as follows:

Table 4: Connectors in OccuSwitch DALI Basic

Number of connectors in use	Not commissioned system	Commissioned system
1 DALI output connector (DA) used Other connector (X) left open	The system regulates all connected luminaires identically. This can cause insufficient further away from the window.	Up to four output groups (window row, corridor row, plus two additional groups) can be set. This allows setting correct light levels for all luminaire groups. The groups do function independently of their physical connection location. For commissioning, see chapter 4.
2 DALI output connectors used (DA and X)	The system regulates window (DA) and corridor (X) luminaires as separate rows. The corridor row has a set offset from the window row.	

Example

Figure 1 shows an example layout of two simple cell offices: The left example uses the two outputs (DA and X) for the window and corridor row. The example on the right shows the use of only one output (in principle the DA output, but it also works on the X output). Here commissioning (allocating luminaires to a specific function) is generally required when daylight depending regulation is used.

2.1.2. OccuSwitch DALI Advanced

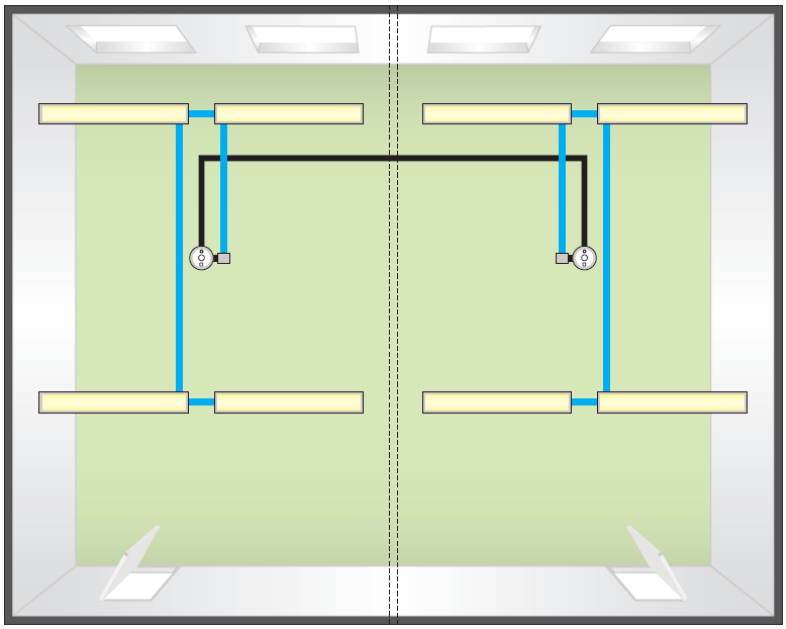


Figure 2: Two grids in one office linked with an OccuSwitch DALI Advanced installation

The OccuSwitch DALI Advanced is a module that allows covering larger areas such as open plan offices. Up to 22 OccuSwitch DALI Advanced modules can be connected in parallel to create lighting zones in an open office. These lighting zones can be used, for example, so that the local lights in one area are switched on at occupancy and the lights of the surrounding areas are automatically set to the background lighting level.

Table 5: Connectors in OccuSwitch DALI Advanced

Output connectors	**Not commissioned system**	**Commissioned system**
DALI Output connector “DA”	The system regulates all connected luminaires identically. This can cause insufficient light further away from the window.	Up to four output groups (window row, corridor row, plus two additional groups) can be set. This allows setting correct light levels for all luminaire groups. For commissioning, see chapter 4.
Parallel link connector “X”	By default the OccuSwitch DALI Advanced is set to local occupancy (Mode 1). Once one OccuSwitch DALI detects occupancy, all OccuSwitch DALI devices on the same parallel link will turn their lights on.	It is possible to set other OccuSwitch DALI devices using the same parallel link to go to background level when one OccuSwitch DALI is occupied (Mode 9).

Example

Figure 2 shows an example with a larger room existing of two office grids with each their own OccuSwitch DALI. The two devices are connected via parallel link, so they can share their occupancy status with each other. This means that when someone enters the office the lights on that side will switch on. A message is send to the neighboring unit. Depending on configuration, the lights in that area will switch on to the normal level or to the background level.

2.1.3. OccuSwitch DALI BMS

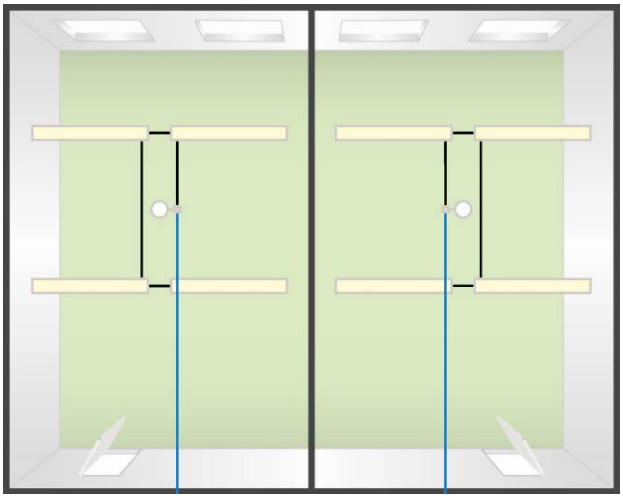


Figure 3: Two cell offices linked to a BMS system

The OccuSwitch DALI BMS is a module that allows connecting a maximum of 64 OccuSwitch DALI devices to a DALI interface, for example of a BMS system. Each OccuSwitch DALI can be assigned to a maximum of 16 groups.

The BMS system can override the local OccuSwitch DALI control. This allows, for example, to switch all lights on when specific alarms occur or to keep all lights off during the night. The BMS system can also retrieve status information from each OccuSwitch DALI device.

Table 6: Connectors in OccuSwitch DALI BMS

Connectors	Not commissioned system	Commissioned system
DALI output connector (DA)	The system regulates all connected luminaires identically. This can cause insufficient further away from the window.	Up to four output groups can be set. This allows setting correct light levels for the luminaire groups. For commissioning, see chapter 4.
DALI input connector (X)	Complete standard DALI interface for connecting to any DALI system. For commissioning, see chapter 4.	

Example

Figure 3 shows an example layout of two cell offices. Each office part has its own OccuSwitch DALI BMS and two rows of luminaires (a window row and a corridor row). The OccuSwitch DALI devices are connected to a BMS system. Both OccuSwitch DALI BMS systems control the connected lights automatically. The BMS system is used to monitor the system and to override the local settings in special situations.

2.1.4. Extension movement sensor

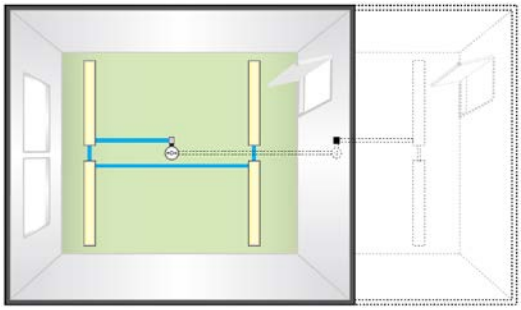


Figure 4: OccuSwitch DALI with an extension movement sensor

The extension sensor (LRM8118) allows extension of the detection area of any OccuSwitch DALI. The sensor is connected to the same DALI line as the luminaires. When the extension movement sensor detects occupancy it sends a trigger to the OccuSwitch DALI. The OccuSwitch DALI reacts on this trigger as if it detected the movement with its built-in movement detection sensor. This means that the luminaires are controlled on movement detection in both the main and the extension area.

The extension movement sensor is ideal for areas, such as classrooms, that are slightly larger or differently shaped than the standard movement detection area of the OccuSwitch DALI. Up to two extension sensors may be connected to one OccuSwitch DALI.

Note:

The extension movement sensor only extends the movement detection range of the OccuSwitch DALI. In some cases it is better to use two OccuSwitch DALI units instead of an extension sensor. For criteria on this, see section 3.2.1.

2.2. Luminaire control

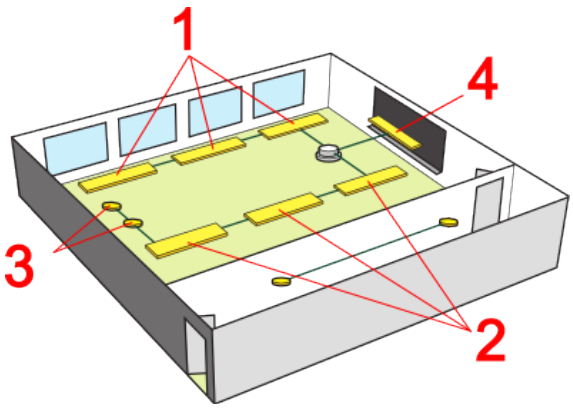
2.2.1. Group assignments

The OccuSwitch DALI can address four different groups of luminaires, by using four DALI groups. The following table shows the groups in which the luminaires can be used.

Table 7: Infrared channels available

DALI slave group	Default function	Description of default function
DALI group 1	Window luminaires	Auto on/auto off, automatic light level regulation for window side.
DALI group 2	Corridor luminaires	Auto on/auto off, automatic light level regulation for corridor side.
DALI group 3	Additional presence luminaires	Auto on/auto off, no automatic light level regulation.
DALI group 4	Additional absence luminaires	Manual on/auto off, no automatic light level regulation.

The following figure shows an application where all groups are in use:



For assigning luminaires to these DALI groups, see section 4.2.3.

The window and corridor side speak for itself, but the additional groups are not so obvious.

Additional presence (group 3) is mainly used for luminaires in the area that do not have a window or corridor function nor daylight regulation and might be changed separately from the main lights. Typical examples are wall washers, task lighting, etc.

Additional absence (group 4) is used for additional luminaires with a specific function. The most common function is board lighting (for schools and meeting rooms).

The OSD will accept luminaires with drivers that have already a DALI group address programmed. Please be aware that you need to program all driver during the DALI commissioning, it is not possible to assign a single luminaire and leave the rest as it is.

Automatic control

This section shows how the automatic control of the OccuSwitch DALI is based on occupancy and daylight regulation.

2.2.2. Occupancy

The OccuSwitch DALI can automatically switch lights ON when the area is occupied and switched them OFF when the area is vacated. After the area is left unoccupied for a set time period, the lights will either switch OFF automatically or first dim to a background level for a set time period.

On some occasions when there is very little movement, the standard delay time of OccuSwitch DALI might be too short. If movement is detected during the turn-off fade (this takes 10 seconds) the lights will return to their “ON” value and the delay time is automatically increased by 10 minutes (Smart Timer).

Movement sensor

The movement sensor is a PIR (Passive Infra Red) sensor that detects occupancy in an area. When installed in a typical office ceiling at 3-metre height (between 2.5 and 4 meter), it is sensitive for small movements within a range of 4 by 5 meters and to large movements within a range of 8 by 6 meters.

The PIR sensor reacts on movement by means of a temperature difference such as the human body temperature versus its surrounding temperature. A car that just starts its engine is not seen by the PIR, nor does it see people sitting within the car or a forklift truck. Therefore it is recommended not to use the OccuSwitch DALI system in outdoor, parking or industrial applications.

The movement detection range can be extended with an extension movement sensor, which has the same viewing specifications as the standard sensor.

> **Note:**
> It is possible to limit the detection area of the movement sensor with a retractable shield.

2.2.3. Daylight regulation

The OccuSwitch DALI has an automatic daylight regulation with a dynamic offset for the window and corridor rows. Daylight regulation helps to keep a constant light level at all situations.

Daylight sensor

The daylight sensor reads the actual average luminance. The intensity of the luminance depends on the amount of artificial and / or natural light in the room as well as on how well this light is reflected towards the ceiling. The light reflection depends highly on the colors and materials chosen to furnish the office.

For more information on this sensor, see section “Light sensing” on page 22.

For calibrating the daylight sensor, see section 0.

Dynamic offset control for window / corridor

Since the window area receives more daylight than the corridor area, window and corridor luminaires are controlled separately. Depending on the amount of daylight entering the room, the output of both window and corridor luminaire rows are dimmed to a minimum level with a difference of 30% between the window and corridor side.

When both window and corridor rows have been dimmed to the minimum level for more than 15 minutes, the window row will be turned off to ensure maximum energy saving. The corridor side, however, will by default only dim to the minimum level, hence indicating to the user that the lighting is operational.

Note: This default can be overridden, in order to turn the corridor row off as well. For this special case, please contact your local Philips representative for details.

In the daylight override function, the lights will switch on when someone enters the room even when there is sufficient natural daylight available.

Figure 5 shows the dynamic behavior (offset) of the window and corridor row luminaires.

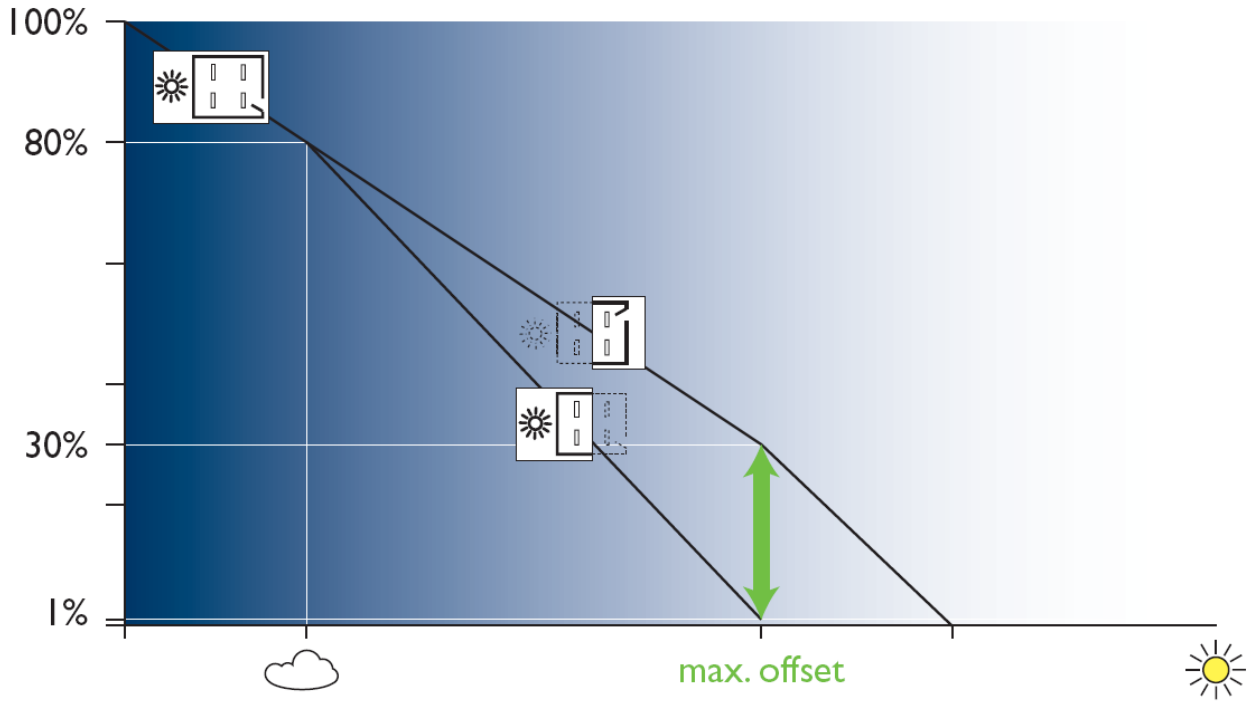


Figure 5: Dynamic offset between window and corridor

2.3. Local manual control

The OccuSwitch DALI can be manually controlled using IR remotes and (with the LCU2070 PBU) normal pushbutton switches. Manual control is required for switching on the system in semi-automatic (manual on / automatic off) applications and for manually overriding the OccuSwitch DALI automatic control functions.

CAUTION
Take into consideration that manual control will always stop the daylight regulation.
The OccuSwitch DALI will start regulating again according when:

- Occupancy after the area was unoccupied (the lights switch off).
- Give a general switch on command (shortly press channel 1 on the remote or switch)
- Select Preset 1 on the OccuSwitch DALI (see section 2.3.7 Presets)

2.3.1. Manual control channels

The manual control can be done on 5 different channels, as shown in the following table:

Table 8: Manual control channels available

IR Control channel	Description
Channel 1 (Default)	Window, corridor and additional presence luminaires. When manually setting the light level, the corridor and additional presence luminaires will follow the window channel with an offset. Daylight override may cause window luminaires to stay off.
Channel 2	Window luminaires
Channel 3	Corridor luminaires
Channel 4	Extra auto on
Channel 5	Additional absence luminaires

By default the remote controls are set to only channel 1, simultaneously controlling window, corridor and additional presence luminaires. Only the IRT8050 can be configured to use other channels. For setting the infrared channels, see the datasheet of the remote.

2.3.2. Channels and groups

It is important to know that the IR channels in our remote controls are used in a different way than originally designed for other systems. There is therefore no direct relation between the output (channels) and IR channels. Here you can find a full overview including the DALI group the OSD is using internally (you do not need to program this yourselves the system does it all by itself).

Output row	IRT9090	IR channel	DALI group
Window luminaires	1	2	1
Corridor luminaires	2	3	2
Extra auto on	3	4	3
Additional absence luminaires	4	5	4
Window + Corridor + Additional presence	Not applicable	1	Not applicable

2.3.3. Manual control with the IRT8050

The IRT8050 can be used in many configurations. The table below shows the most common configurations. The default settings of the IRT8050 are listed on the first line. For more information please check the datasheet of this device.

Table 9: Manual control functions with the IRT8050

Normal application function	Switch		**OSD Channel**				**8050 DIP**					**IRT 8050 function**	
		Dim	1	2	3	4	4	5	6	7	8		
General on/off dim	•	•	•	•	•							Ch 1 Off / Down	Ch 1 On / Up
Window side	•	•	•				•					Ch 2 Off / Down	Ch 2 On / Up
Corridor side	•	•		•				•				Ch 3 Off / Down	Ch 3 On / Up
Additional lighting	•	•			•		•	•				Ch 4 Off / Down	Ch 4 On / Up
Board lighting	•	•				•			•			Ch 5 Off / Down	Ch 5 On / Up
General on/off	•		•	•	•	•	•		•			All Off	Preset 1
General lighting + window control	•	•	•	•	•			•		•		Ch 1 On & Ch 1 Off	Ch 2 On & Ch 2 Off
Window/corridor control	•	•	•	•			•	•		•		Ch 2 On & Ch 2 Off	Ch 3 On & Ch 3 Off
General on/off/dim + board lighting	•	•	•	•	•	•		•	•	•		Ch 5 On & Ch 5 Off	Ch 1 On & Ch 1 Off

The combined function off/dim down and on/dim up can be operated with a short press (switch on or off) or by a long press, enabling the dimming function.

2.3.4. Manual control with the IRT8010

The IRT8010 is a single channel remote control.
Please note that the IRT8010 cannot address the second additional channel (DALI group 4).

The IRT8010 is a two-key remote control, suitable for switching on / off and dimming up / down single lighting control circuits (one channel control). It enables manual override of the OccuSwitch DALI automatic control system. The control can only handle IR channel 1, so in combination with the OSD general on/off and dim commands can be send. The IRT8010 is suitable for schools / classrooms and meeting rooms. When placed in the LRH810 holder it can also function as 'wall switch'.

Note: you cannot change the function of this device, only the IR group it belongs to.

The infrared group address can be set with a rotary switch within the unit itself.

Use (section 2.3.1)	**Button marked 0**	**Button marked 1**
Manual control channel 1 (window, corridor and additional presence)	Short press: lights off Long press: lights dim down	Short press: lights on Long press: lights dim up

2.3.5. Infrared manual control groups

The OccuSwitch DALI contains an infrared receiver that enables the manual (remote) control of the system. For the maximum distances of the controls to the receiver, see the datasheets of the relevant controls.

Infrared group addressing makes it possible to control individual light groups in open plan offices without affecting the light level of neighbors. The OccuSwitch DALI can be set to one of seven available groups (group A, B, C, D, E, F or G).

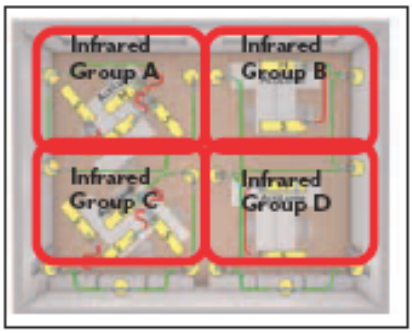


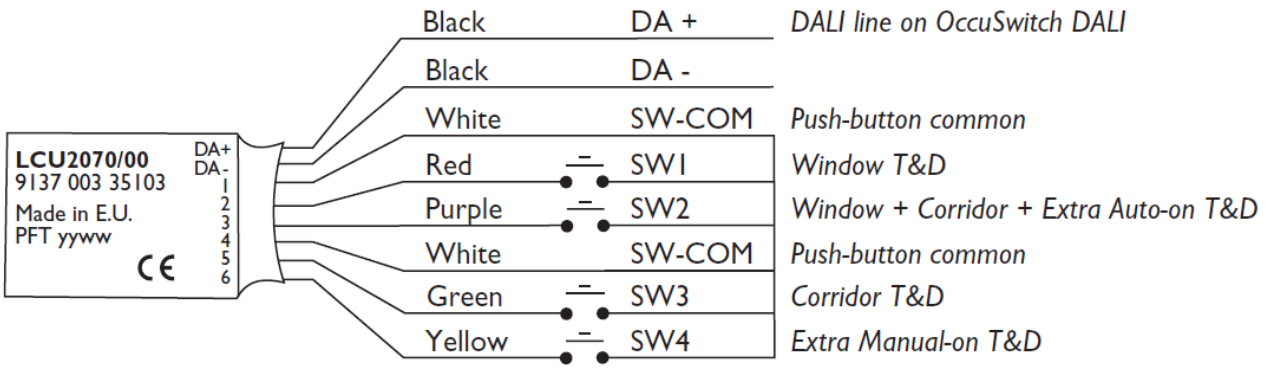
Figure 6: Infrared groups

The default infrared group for the OccuSwitch DALI and the remote controls is group A. The OccuSwitch DALI and the remote control must always operate in the same group.

Setting the infrared group of the OccuSwitch DALI is done with the IRT9090, see section 4.2.11.

2.3.6. Manual control with standard switches and the LCU2070

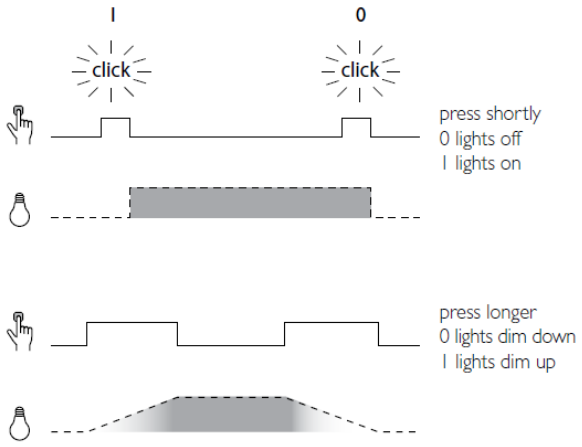
The LCU2070 push button interface makes it possible to connect any type of push button to the OSD system. The connection is simple, connect the interface (with the black wires) to the DALI line, and connect 1 till 4 switches to the unit. Each switch has a specific function. This function is fixed.



Note:

Extra auto-on = additional presence luminaires
Extra manual-on = additional absence luminaires

The switches work with a Touch & Dim function that also can be found in many drivers. The function is show on the right hand side.



2.3.7. Presets

Presets are used to recall pre-programmed light scenes. Selecting presets is only possible with the IRT8050 (or via a DALI scene command on the DALI BMS system). There are 4 presets available, as shown in the following table:

	Preset 1	**Preset 2**	**Preset 3**	**Preset 4**
Window row	Automatic	100%	50%	10%
Corridor row	Automatic	100%	50%	10%
Extra Auto-on row	100%	100%	50%	10%
Extra Manual-on row	Unchanged	100%	50%	10%

Preset 1 is fully automated mode of the OccuSwitch DALI. When selecting this mode, the automatic daylight regulation starts working, based on the calibrated maximum light level.

Preset 2 to 4 use the predefined light level as shown in the table. When the OccuSwitch DALI is set to one of these presets, all luminaires react in the same way. For example, setting the OccuSwitch DALI to preset 3 causes all luminaires go to 50% of the maximum light level.

Note: In the OccuSwitch DALI Basic and OccuSwitch DALI Advanced systems the presets values cannot be changed. In the OccuSwitch DALI BMS the DALI master can set one light level value for each of the presets 2-4. This light level is then used in this preset for all luminaires.

2.3.8. Manual control of multiple OccuSwitch DALI

Sometimes it is required that two OSD units are manually controlled by one user interface.

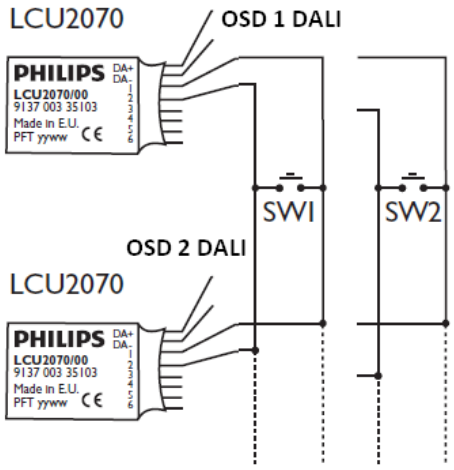
Using IR remote controls

In general the IR remote controls will have a reach of 5 .. 7 meter. However the IRT9090 can cover a distance of up to 17meter. So you can control a neighboring OSD as well, provided they use the same IR group.

Using standard switches and the Push Button Interface

You can connect a single switch to multiple push buttons units. You need a LCU2070 PBU per OSD unit you want to control.

The schematic on the right shows the general idea.



3. Application design

To design the OccuSwitch DALI in any application, the designer must:

1. Select the number of control areas to use and define the position of the sensors.
2. Choose the OccuSwitch DALI type(s) to use: stand-alone, linked or controlled from a central building management system.
3. Choose or design the mode that each OccuSwitch DALI needs to work in.

Each of these steps is explained in more detail in the subsections of this chapter Selecting the number and position of detection fields
The number of OccuSwitch DALI to be used in an application on one hand depends on the area that needs to be covered by the sensors and on the other hand on the number of output luminaires to control.

3.1.1. Luminaire output

The DALI output of the OccuSwitch DALI can be loaded with a maximum of 15 DALI drivers or extension sensors.
As each luminaire is usually controlled by one driver, the maximum area to be controlled by one OccuSwitch DALI is restricted to 15 drivers. This number is reduced when using one or more extension sensors: each extension sensor counts for one DALI driver. The maximum number of extension sensors per OccuSwitch DALI is 2: in this case the 13 luminaire drivers can be controlled.

If the lighting requirements for an area require more than 15 luminaires, the area should be split in to sub areas. Each of these sub areas can then be controlled by a separate OccuSwitch DALI.

3.1.2. Use area

The OSD is detecting movement for occupancy and measuring light levels for daylight depending control.

The detection area of the OccuSwitch DALI is defined by the detection limits of its movement detection sensor and its light sensor. To ensure a reliable working, the number of OccuSwitch DALI in the application must be defined with these detection fields in mind.

The detection area of the OccuSwitch DALI and the extension sensor depends on the height of the ceiling where it is installed. In this manual, an installation height between 2.5 and 3.5 meter is assumed.
Note: if you want to use the OccuSwitch DALI in an application with a ceiling height of less than 2.5 meters, the detection area is significantly smaller. Please contact your local Philips representative for the exact dimensions.
Note: use of the OccuSwitch DALI in an application with a ceiling height of more than 4 meters may result in unreliable movement detection, and is therefore advised against.

Movement detection

At a ceiling height of 3 meter, the maximum movement detection area of both the OccuSwitch DALI and the extension sensor is 6 by 8 meter. All over this zone, the OccuSwitch DALI or extension sensor can detect relatively large movements. In the center of this zone (an area of 4 by 5 meter), it is more sensitive and can detect even small movements of a couple of centimeters.

When a part of the sensor's viewing area should not be used for movement detection, the area of movement detection can be partially reduced by the retractable view shield (see Figure 8).

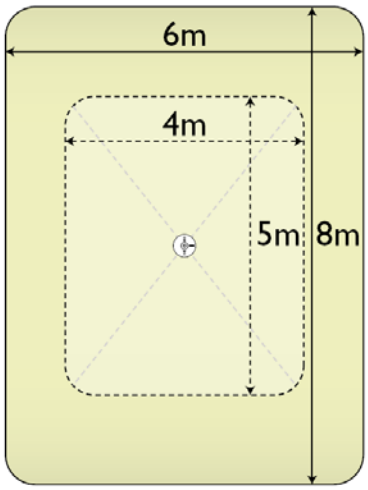


Figure 7: Movement detection range

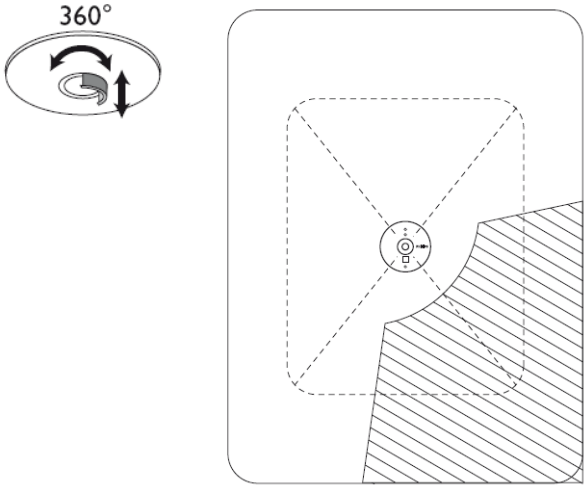


Figure 8: Shielding the movement detection range

For applications where little movement is made, like an office application, the number of movement detection sensors must be calculated by dividing the total area of the room in parts of 4 by 5 meter. In the center of each of these parts, one OccuSwitch DALI or extension sensor must be placed. For choosing whether to use multiple OccuSwitch DALI or to use one OccuSwitch DALI with extension sensors, see section 3.2 "Selecting the OccuSwitch DALI type" on page 23.

For applications where larger movements are made, like a corridor or a central hall, the outer detection area can also be used, so the total area can be divided in parts of 6 by 8 meters.

Note: To ensure reliable movement detection, all of the applicable space must be covered by the detection area of either an OccuSwitch DALI or an extension sensor. Therefore, for calculating the rough number of OccuSwitch DALI or extension sensors, the resulting number of dividing the total area by the sensor detection area must be rounded up towards the next whole number.

Tip: When placing the designed position of the OccuSwitch DALI or extension sensor in an installation drawing, note the direction of the detection area. The OccuSwitch DALI or extension sensor must be placed according to this direction. To do this alignment, the "Philips" wordmark and the sensor line-up can be used.

Light sensing

At a ceiling height of 3 meter, the light sensing area of the OccuSwitch DALI is a square area of 4.5 x 4.5 meter.

The OccuSwitch DALI should be installed in such a way that the daylight sensor is positioned not too close to the window. If the sensor is mounted too close to the window, sunlight reflections from the windowsill or objects outside (for example snow or a car) can enter directly into the sensor, making the OccuSwitch DALI regulate on an incorrect light level.

Tip: The light sensing area of the OccuSwitch DALI is usually correct when the movement detection area does not extend outside any window.

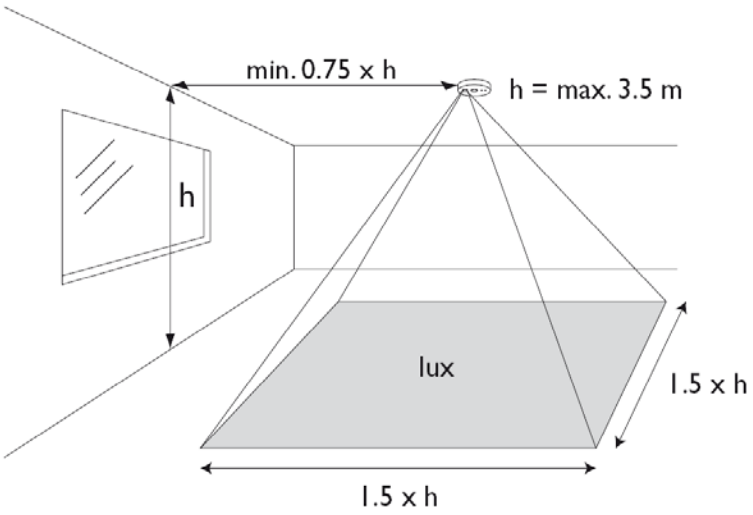


Figure 9: Light detection range and position

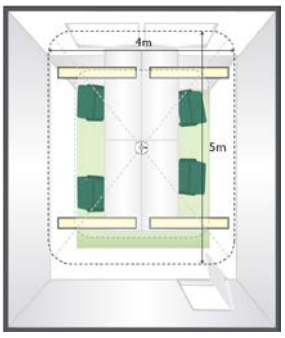
3.2. Selecting the OccuSwitch DALI type

When the detection areas are known, you should define which sensor to use for each area: an OccuSwitch DALI Basic, OccuSwitch DALI Advanced, OccuSwitch DALI BMS, or an extension sensor. This decision should be based on the grouping of the detection areas, and the amount of communication needed between these groups.

3.2.1. OccuSwitch DALI or extension sensor

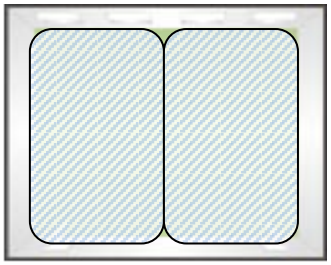
First step is to select for each detection area between using an OccuSwitch DALI or an extension sensor. To this purpose you must define application areas, where all the luminaires must be dimmed as a group. An application area may contain one or more detection areas, but can be controlled by one single OccuSwitch DALI. If the application area contains more than one detection field, the extra fields will be monitored by extension sensors connected to the same OccuSwitch DALI. Take care however that the total number of luminaires and extension sensors per OccuSwitch DALI does not exceed the maximum allowed load.

In the simplest case, a room is so small that it is totally covered by one detection area. In this case there is only one application area, which consists of only one detection area. This application area needs one OccuSwitch DALI without any extension sensors.

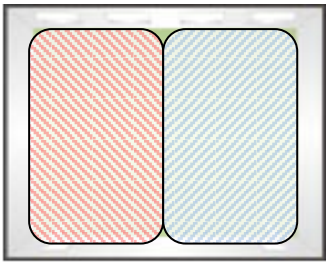


In a larger room, multiple detection or control areas are needed. These detection areas must be grouped into application areas:

- If the light levels all over the room must be controlled as a whole, the detection areas in the room are grouped as only one application area, which can be controlled by one OccuSwitch DALI. The additional detection area is covered by using an extension sensor.



- If the luminaires in the different detection areas may be dimmed separately, each detection area can be defined as a application area. For each application area, one OccuSwitch DALI is used.

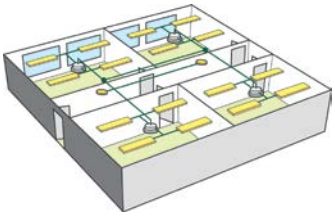


If communication between OccuSwitch DALI is used (see next section), it is still possible and fairly easy to make separate application areas work as one regarding movement detection. Splitting an application area is much harder, as it needs replacement of an extension sensor by an OccuSwitch DALI, and a split in the DALI connection. It is therefore recommended to carefully choose between an extension sensor and an OccuSwitch DALI.

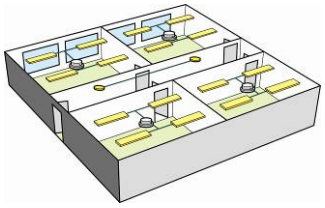
3.2.2. Type of OccuSwitch DALI

After defining for each area whether an OccuSwitch DALI or an extension sensor is used, you can select for each OccuSwitch DALI which model to use, depending on the need for communication with any neighboring application areas and/or a building automation system:

- If the OccuSwitch DALI Basic is used, no communication will take place with neighboring application areas or a building automation system. It will operate stand-alone, dimming and switching the light according to its own measurements and that of any connected extension sensors.

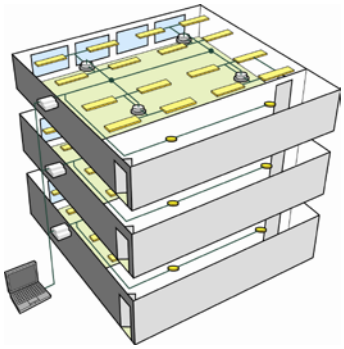


- If the OccuSwitch DALI Advanced is used, OccuSwitch DALI can be connected to each other via a “Parallel link”. Each OccuSwitch DALI regulates the light level according to its own measurements, but in addition it will use the parallel link connection to report and react on movement detection. If one of the connected OccuSwitch DALI detects movement, it reports this on the parallel link. Each of the other OccuSwitch DALI on the link are set to either:
  - switch the local luminaires as if movement was detected locally, or
  - switch the local luminaires on, at a pre-programmed background lighting level.



- If the OccuSwitch DALI BMS is used, the OccuSwitch DALI will communicate with a DALI-capable building management system

  Note: In a DALI network it is not possible for OccuSwitch DALI devices to exchange data directly with each other. All communication is going via the DALI master.



3.3. Selecting the OccuSwitch DALI mode

Once lay-out of the OSD is designed (as explained in section 3.2), it has to be specified how the OccuSwitch DALI must react on its movement detection, light sensor, and optional parallel link. The OccuSwitch DALI has 10 application modes (9 predefined and one customizable) that define how the connected luminaires are controlled.

Table 10 shows the application modes and their parameters. For an explanation of the parameters in this table, see below:

- **Auto switch-ON**: the lights will automatically switch on when someone enters the area.
- **Auto switch-OFF**: the lights will automatically switch off when the area is vacated (and no parallel link activity has taken place) for the duration given with the potentiometer.
- **Smart timer**: when the lights automatically switch off, and a movement is detected during this fade down, the OccuSwitch DALI temporarily extends the movement detection period (as given with the potentiometer). The smart timer value shown in the table defines with how many minutes the movement detection period will be extended.

- **Prolong time**: the OccuSwitch DALI will keep its luminaires on background level for this many minutes, before switching the luminaires off. See also Figure 10 below.
- **Activity on parallel link acts as**: defines what action the OccuSwitch DALI will take an event occurs on its parallel link while its luminaires are off. Two options exist: local occupancy means that the OccuSwitch DALI will act as if local occupancy is detected; background lighting means that the OccuSwitch DALI will switch all its luminaires on at the background level.
- **Daylight dependent regulation**: luminaires will be dimmed depending on the measured light level.
- **Daylight switching on window/corridor side**: when sufficient daylight is available the luminaires (of the given side) will be switched off.
- **Daylight override**: when the OccuSwitch DALI detects movement and sufficient daylight is available, the luminaires for which daylight switching is enabled will not switch on.

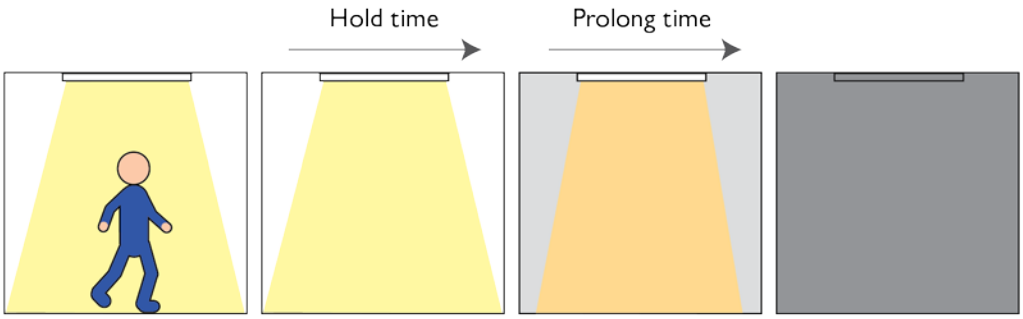


Figure 10: Movement detection phases

Selecting a mode for an OccuSwitch DALI can be done in two ways:

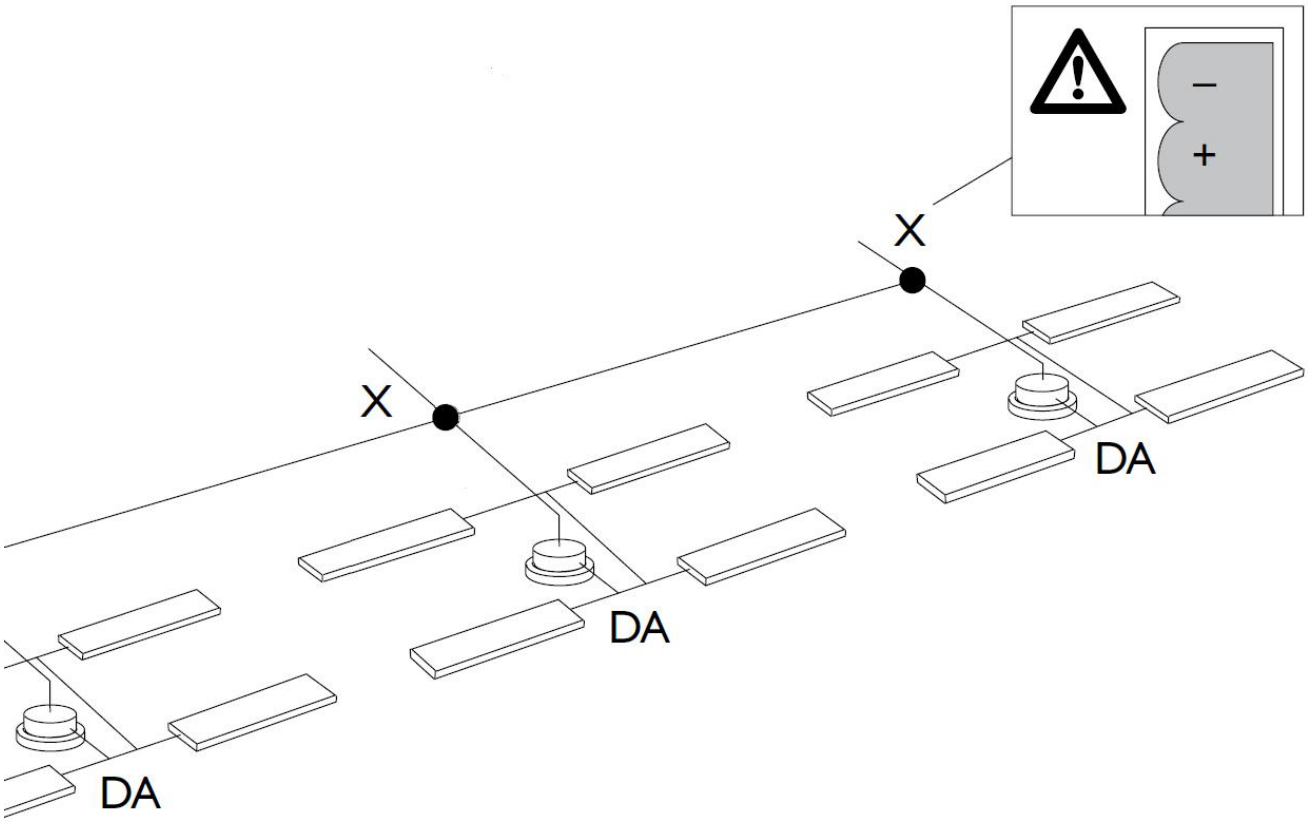
- For an easy selection, look up the mode based on the application that the OccuSwitch DALI is used in. To select the mode, find the application type in the table.

  For example: when using an OccuSwitch DALI Advanced in an open plan office, with parallel link connected, the OccuSwitch DALI can be placed in mode 9: “Open plan office with parallel link”.
- For a more advanced selection, select the mode based on the parameters.

  If the required set of parameters is not listed as one of the modes 1-9, you may select to use a custom application mode, which is mode 10. For more information on using this custom mode, please contact your Philips representative.

3.3.1. Parallel operation and open plan mode (mode 9) LRM2080 only

The LRM208x can be used in parallel mode. With this feature different (up to 22) units can be connected in parallel as the figure below shows.



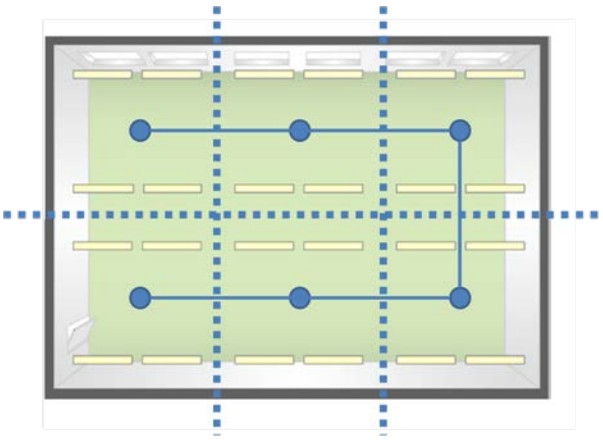
In all modes, except mode 9, parallel operation means that occupancy is truly handled as parallel. In other words if one sensor picks up occupancy, all devices will react as if their own sensor was triggered.

Parallel operation does not mean that the units act in the same way!

Only the occupancy trigger is shared. The units will switch off in different ways if timers are set in different ways. For this the OSD has a digital potentiometer for the delay timer. If set around 15 minutes, the unit will make the time exactly 15 minutes. So if several units are used in the same area, please set the timer at almost the same position. When the complete area is now vacated all units will switch off (or dim to background level) within 3 seconds.

Mode 9 is a special mode for this parallel operation. The OSD will now make a difference if it detects occupancy by itself or when it gets a message from its neighbor. In the first case lights will switch on to nominal level, in the second case lights will switch on and dim to background level.

Let's look at an example. The office on the right exists of 6 office grids with an OSD in each grid.



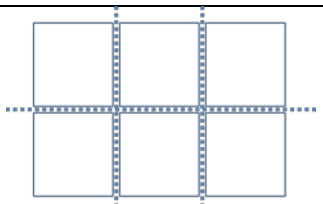
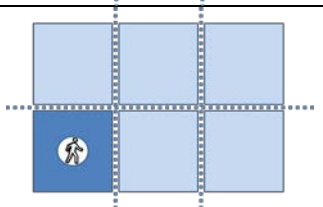
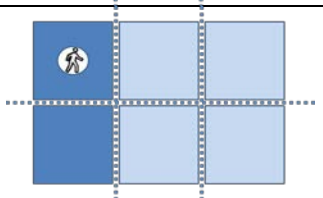
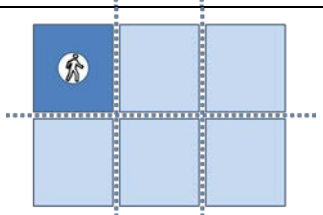
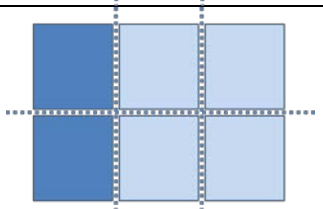
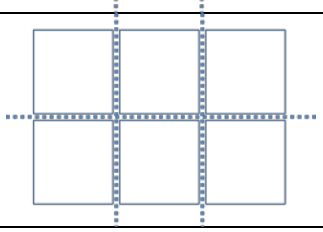
At starts the area is vacated for some time and all lights are off.	
If somebody enters the area all lights will switch on, but at the location where the person is present lights will be on full, in all other area's lights will switch on background level.	
If the person moves to another section, lights in that grid will dim up to nominal level. In the vacated area lights will stay on at this level, until the timer expires.	
After the timer in the first grid expired lights in that section will dim to background level.	
If the person leaves the room al together lights in grids on his/her way out will be again at nominal level. This will remain until the timers expire.	
If no occupancy is detected in either of the OSD units and all timers have expired, all lights will switch off.	

Table 10: Mode setting overview

Mode	Application	Occupancy related					Daylight level related			
		Auto switch-ON	Auto switch-OFF	Smart timer (minutes)	Activity on parallel link acts as	Prolong time (minutes)	Daylight dependent regulation	Daylight switching on window side	Daylight switching on corridor side	Daylight override
1	Cell office	Enabled	Enabled	10	Local occupancy	0	Enabled	Enabled	Disabled	Enabled
2	Open plan office	Enabled	Enabled	10	Local occupancy	120	Enabled	Enabled	Disabled	Enabled
3	Class room	Disabled	Enabled	10	Local occupancy	0	Enabled	Enabled	Enabled	Disabled
4	Cell office without movement detection	Disabled	Disabled	N.A.	N.A.	0	Enabled	Enabled	Disabled	Disabled
5	Open plan office without movement detection	Disabled	Disabled	N.A.	N.A.	0	Enabled	Enabled	Disabled	Disabled
6	Corridor	Enabled	Enabled	10	Local occupancy	60	Enabled	Enabled	Enabled	Enabled
7	Toilets	Enabled	Enabled	0	Local occupancy	15 *)	Disabled	Disabled	Disabled	Disabled
8	Meeting room	Disabled	Enabled	10	Local occupancy	0	Enabled	Enabled	Disabled	Disabled
9	Open plan office with parallel link	Enabled	Enabled	10	Background lighting	0	Enabled	Enabled	Disabled	Enabled
10	Custom									

*) Only on “window row” luminaires

4. Commissioning

The physical installation of the OccuSwitch DALI system is described in quick starting guide (that comes with the product) and the OccuSwitch DALI datasheet

Once installed, the OccuSwitch DALI system is ready to be used in its default mode. However, to assign the connected luminaires to the correct groups and to set other settings according to the design, the OccuSwitch DALI system needs to be commissioned. The sections in this chapter show how this is done.

The commissioning of the OccuSwitch DALI is done using the following equipment:

- Service pushbutton on the OccuSwitch DALI
- Potentiometer on the OccuSwitch DALI
- IRT9090 extended IR (infrared) programming and commissioning tool
- DALI master system (BMS version only)

The table below shows what functions can be done with each commissioning tool. Each function (except switching on/off) is described in the subsequent sections of this chapter.

Tool	Programming function
Service button	• **Set reference light level to current level** • **Set reference light level by auto-calibration**
Potentiometer	• **Set value of delay timer**
IRT9090	• **Set reference light level to current level** • **Check parallel link (movement test test)** • **Assign luminaires to any group** • **Set light level of background lighting** • **Request current application mode** • **Set application mode** • **Set power-up state** • **Set IR group address** • **Reset to factory settings** • **Switch luminaires on/off** • **Activate 100h burn in**

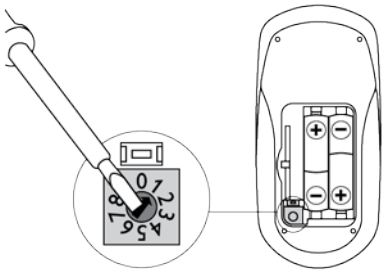
4.1. Configure controls and switches

This section describes how to set the infrared group and channel settings for Infrared remote controls IRT8010, IRT8050 and UID8510.

4.1.1. IRT8010

In order to avoid that all lighting circuits in one room are switched unintentionally, the transmitters present in one room and their respective receivers can be given an individual infrared group address.

The group address of the transmitter must match the group address of the OccuSwitch DALI. The group address of the transmitter can be changed by using the rotary switch in the battery compartment, see Figure 11.



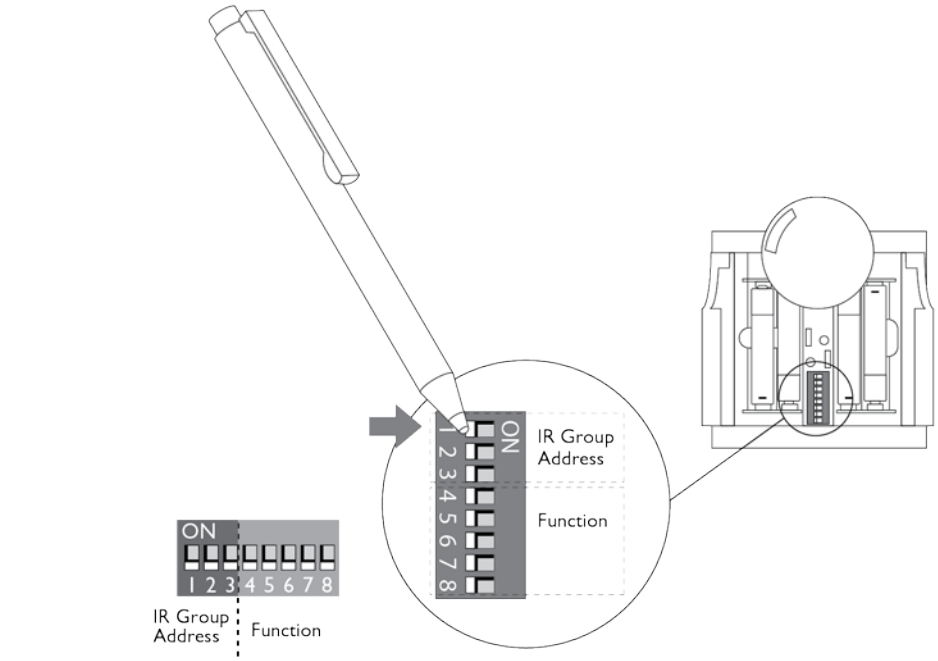
	Group address
0	General
1	A
2	B
3	C
4	D
5	E
6	F
7	G
8	WM/LM

Figure 11: IRT8010 settings

4.1.2. IRT8050

In order to avoid that all lighting circuits in one room are switched unintentionally, the transmitters present in one room and their respective receivers can be given a different infrared group address.

The group address of the transmitter must match the group address of the OccuSwitch DALI. The group address of the transmitter can be changed by dipswitches, see Figure 12.



	1	2	3
A			
B	ON		
C		ON	
D	ON	ON	
E			ON
F	ON		ON
G		ON	ON
General	ON	ON	ON

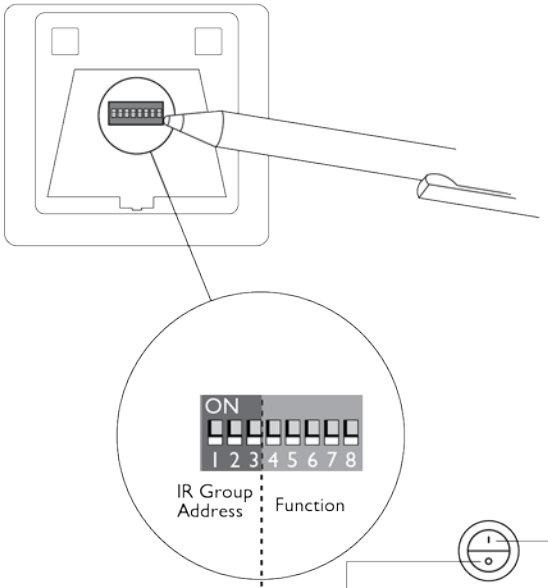
LEFT KEY	RIGHT KEY	4	5	6	7	8
Ch1 off/down	Ch1 on/up					
Ch2 off/down	Ch2 on/up	ON				
Ch3 off/down	Ch3 on/up		ON			
Ch4 off/down	Ch4 on/up	ON	ON			
Ch5 off/down	Ch5 on/up			ON		
All off	Preset 1	ON		ON		
All off	Preset 2		ON	ON		
All off	Preset 3	ON	ON	ON		
All off	Preset 4				ON	
Blinds down	Blinds up	ON			ON	
Ch1 on/off	Ch2 on/off		ON		ON	
Ch2 on/off	Ch3 on/off	ON	ON		ON	
Ch3 on/off	Ch4 on/off			ON	ON	
Ch4 on/off	Ch5 on/off	ON		ON	ON	
Ch5 on/off	Ch1 on/off		ON	ON	ON	
All off	Preset 1/Preset 2	ON	ON	ON	ON	
All off	Preset 1/Preset 3					ON
All off	Preset 1/Preset 4	ON				ON
All off	Preset 4/Preset 3		ON			ON
All off	Preset 4/Preset 2	ON	ON			ON
All off	Preset 4/Preset 1			ON		ON

Figure 12: IRT8050 settings

4.1.3. UID8510

In order to avoid that all lighting circuits in one room are switched unintentionally, the transmitters present in one room and their respective receivers can be given a different infrared group address.

The group address of the transmitter must match the group address of the OccuSwitch DALI. The group address of the transmitter can be changed by dipswitches on the back of the user interface, see Figure 13.



	1	2	3
A			
B	ON		
C		ON	
D	ON	ON	
E			ON
F	ON		ON
G		ON	ON
General	ON	ON	ON

		4	5	6	7	8
Ch1 off/down	Ch1 on/up					
Ch2 off/down	Ch2 on/up	ON				
Ch3 off/down	Ch3 on/up		ON			
Ch4 off/down	Ch4 on/up	ON	ON			
Ch5 off/down	Ch5 on/up			ON		
All off	Preset 1	ON		ON		
All off	Preset 2		ON	ON		
All off	Preset 3	ON	ON	ON		
All off	Preset 4				ON	
Blinds down	Blinds up	ON			ON	
Ch1 on/off	Ch2 on/off		ON		ON	
Ch2 on/off	Ch3 on/off	ON	ON		ON	
Ch3 on/off	Ch4 on/off			ON	ON	
Ch4 on/off	Ch5 on/off	ON		ON	ON	
Ch5 on/off	Ch1 on/off		ON	ON	ON	
All off	Preset 1/Preset 2	ON	ON	ON	ON	
All off	Preset 1/Preset 3					ON
All off	Preset 1/Preset 4	ON				ON
All off	Preset 4/Preset 3		ON			ON
All off	Preset 4/Preset 2	ON	ON			ON
All off	Preset 4/Preset 1			ON		ON
All off	Preset 1, Pre 2, Pre 3, Pre 4	ON		ON		ON
All off	Preset 4, Pre 3, Pre 2, Pre 1		ON	ON		ON
Absent + All Off	Setpoint 0 + Preset 1	ON	ON	ON		ON
Blinds down/stop	Blinds up/stop				ON	ON

Figure 13: UID8510 settings

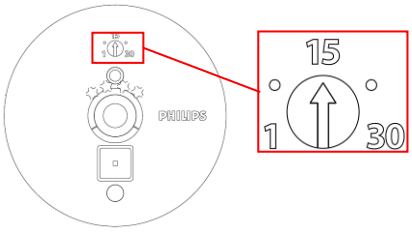
4.2. Configure the OccuSwitch DALI

4.2.1. Checks

Make sure that the OccuSwitch DALI system has been installed correctly, by checking the LEDs and luminaires function.

4.2.2. Motion detect timer

The motion detect timer defines the time after which the lights will be turned to the background light level, or be turned off.



1. Turn the potentiometer to the desired value.

As shown in the figure, the potentiometer range is not linear, but divided in a number of possible settings.

4.2.3. Assigning luminaires to OccuSwitch luminaire groups

1. Press **DALI address** to start the allocation process.

The luminaires flash indicating that the OccuSwitch DALI has received the command. One by one all luminaires will dim. When this process stops one luminaire starts to blink.

2. Select the group this luminaire should be assigned to, **1** = (Window), **2 =** (Corridor), **3 =** (Additional Presence) or **4**= (Additional Absence).

Directly after sending the group number another luminaire starts to blink.

Repeat step 2 for all other luminaires. When all luminaires are assigned to a group, all luminaires will blink once, and the OccuSwitch DALI returns to normal operation.

Notes:

- At all actions, stay close to the OccuSwitch DALI and point the remote control towards the sensor.
- The procedure above can be aborted at any moment by pressing **DALI address** again. Aborting the assign process resets all luminaires and/or drivers to un-commissioned state. See section 2.1 for the behavior of the OccuSwitch DALI in un-commissioned mode.
- If the infrared group is not assigned correctly you can:
  - reset the system to un-commissioned mode and re-program the luminaires

  or
  - reset the complete OccuSwitch DALI to factory settings (see section 4.3).

4.2.4. Calibration of the required light level

The OccuSwitch DALI will already function quite well in most applications since the factory settings are designed for the common offices. However calibration is required to reach optimal cost savings, and to be certain that the minimal required light levels are met.

The OccuSwitch DALI should be calibrated after:

- The furniture is in placed in the room.
- Major changes have been made to the room or furniture placement.

Before calibration

- Make certain you have the right tools (IRT9090 and a lux meter)
- Make certain that the daylight contribution to the rooms light level is less than 70%. You can easily check this. The level you measure with the lights switched off should be below 70% of the required light level.
  Closing the curtains or sun blinds can already take care of this
- Make certain that the amount of daylight is not fluctuating during the measurement. A partly clouded sky with fast moving clouds can hamper the right measurements.

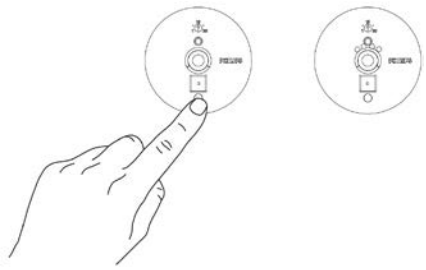
While this section describes several methods to calibrate the system, it is recommended to use the IRT9090 extended IR programming tool for system calibration.

Manual calibration with the push button and current light level

The following tools are required for this method:

• IR remote control unit.

• Stepladder for operating the service button.



1. Change the light level to the correct light value, using the IR remote control.
2. Press the push button on the OccuSwitch DALI for at least 3 seconds.
   The LED blinks in a cycle of “long yellow - short green” to indicate that calibration is about to start.
3. For a more reliable calibration, get out of the sensor’s measuring area now.
   After 10 seconds the OccuSwitch DALI takes the current light sensor value as new set point.
   The LED stops its visual indication and the luminaires flash once indicating that calibration is completed.

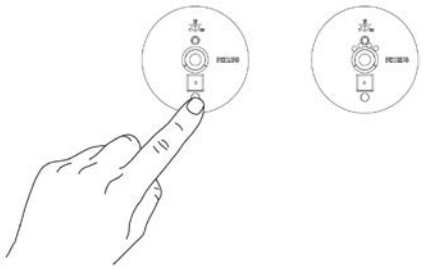
Caution: When the OccuSwitch DALI is calibrated manually with the push button and using an IR control, the offset can be different from an automated mode.

Automatic calibration with the push button and installed light level

The following tools are required for this method:

• IR remote control unit

• Stepladder for operating the service button.



1. Press the push button on the OccuSwitch DALI for at least 3 seconds.
   The LED blinks in a cycle of “long yellow – short green” to indicate that calibration is about to start.
2. Within 10 seconds, press the push button again.
   The LED blinks in a cycle of “long red – short green” to indicate that calibration is about to start.
3. For a more reliable calibration, get out of the sensor’s measuring area now.

   After 10 seconds the OccuSwitch DALI switches the lights OFF.

   After 2 seconds the OccuSwitch DALI takes a measurement of the Light sensor to measure the light level when the lights are OFF.

   The OccuSwitch DALI then switches the lights ON at 100%.

   After 10 seconds the OccuSwitch DALI takes a measurement of the Light sensor to measure the light level when the lights are fully ON.

   The LED stops its visual indication and the luminaires flash once indicating that calibration is completed.

Calibration with remote control

1. Place a light meter on a representative place.
2. Measure the light level and adjust it by pressing the up or down **Arrow keys**.
3. If the light level is adjusted to the correct value, press the **Save** button.

The luminaires blinks to indicate that the setting has been stored.

Note:

At all actions, stay close to the OccuSwitch DALI and point the remote control towards the sensor.

4.2.5. 100 hour burn-in mode

Most lamp manufacturers advise not to dim (to a low level) the fluorescent lamps for a period of 100 hours prior to normal use, in order to maintain light quality at (very) low dimming level.

The OccuSwitch DALI 100h burn-in mode adapts all dimming functions during this period, to make sure that the lights are not dimmed. Only during movement test (to test the installation) and commissioning, dimming is allowed to make the necessary adjustments.

1. Point the remote towards the OccuSwitch DALI and press 100h to enable or to disable the parameter.

The luminaires will flash once to confirm the selection.

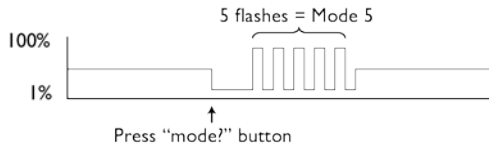
When the 100h burn-in mode is active, the LEDs on the OccuSwitch DALI are continuously green when the lights are switched on. (The LED may blink when motion is detected).

4.2.6. Request application mode

The OccuSwitch DALI controller has 10 pre-defined application Modes. The default application mode is Mode 1 (Cell office). The IRT9090 can be used to request the actual application mode.

1. Point the remote towards the OccuSwitch DALI and press **Mode?**

The luminaires dim, and then start to flash. The number of light flashes is equal to the actual application mode, as displayed in figure below.



4.2.7. Mass programming

The ease the commissioning process of a whole installation, the IRT9090 can be pre-programmed with the application mode, the background level, the power-up state and infrared group address. These four settings will remain stored in the IRT9090 remote, and are sent each time the green **Send** button of the remote is pressed. For resetting these values, see section 4.3.

4.2.8. Set application mode

The OccuSwitch DALI controller has 10 pre-defined application modes. The default application mode is Mode 1 (Cell office). The IRT9090 can be used to set the application mode.

1. Press the **Mode** button.
   The LED on the transmitter starts to blink.
2. Select the required mode by pressing **1...9** (for mode number **10** press **1** followed by **0**)
   The LED will stop blinking, the mode is now set within the remote.
3. Point the remote towards the OccuSwitch DALI, and press the green **Send** button.

The remote sends all stored settings (application mode, power-up state, background lighting level and IR group).

The luminaires will flash once to confirm the selection.

4.2.9. Background level

In some application modes, the light level of all outputs is set to a “background” level if there is no movement detection for 15 minutes. This background level is by default set to 20% of the maximum output level, but can be changed with the IRT9090.

1. Press the **Background %** button.
   The LED on the transmitter starts to blink.
2. Select the background level (10% - 70%, or “min.”).
   The LED will stop blinking, the background level is now set.
3. Point the remote towards the OccuSwitch DALI, and press the green **Send** button.

The remote sends all stored settings (application mode, power-up state, background lighting level and IR group).

The luminaires will flash once to confirm the selection.

Note:
The “Prolong time (background period)” is defined by the application mode and cannot be changed.

4.2.10. Power-up state

The power-up state defines what action the OccuSwitch DALI takes after a power-up or a power interrupt:

- If the power-up state is set to OFF, the OccuSwitch DALI will keep the luminaires off during the first 20 seconds after power-up (sensor stabilization time). After these 20 seconds, OccuSwitch DALI will start normal operation:
  - No movement detection: luminaires will stay off.
  - Movement detection and insufficient daylight: luminaires will be switch on.
- If the power-up state is set to ON, the OccuSwitch DALI will turn the luminaires on immediately at power-up. If no movement is detected, the lights will turn off after 5 minutes.

The power-up state can be set to On or Off by means of the IRT9090.

1. Press the **Power up** button.
   The LED on the transmitter starts to blink.
2. Select the power-up state, either **On** or **Off**.
   The LED will stop blinking, the power-up state is now set.
3. Point the remote towards the OccuSwitch DALI, and press the green **Send** button.

The remote sends all stored settings (application mode, power-up state, background lighting level and IR group).

The luminaires will flash once to confirm the selection.

4.2.11. Infrared group address

The Infrared group address (group A, B, C, D, E, F or G) of each OccuSwitch DALI controller can be set by means of the IRT9090. The infrared group address of the end user remote (IRT8010, IRT8050, etc) control unit must be set on the remote control unit itself (rotary or dip switches). Changing an infrared group address is only useful if infrared is used in open plan offices (personal light control).

1. Press the **IR group** button.
   The LED on the transmitter starts to blink.
2. Select the **IR** group (**A…G**).
   The LED will stop blinking, the IR group is now set.
3. Point the remote towards the OccuSwitch DALI, and press the green **Send** button.

The remote sends all stored settings (application mode, power-up state, background lighting level and IR group).

The luminaires will flash once to confirm the selection.

4.3. Reset to factory defaults

The OccuSwitch DALI system can be set to default factory settings (out of the box settings) using the IRT9090.

1. Press the **Reset** button.
   The LED on the transmitter starts to blink.
2. Point the remote towards the OccuSwitch DALI and press the green **Send** button.

The luminaires will flash once to confirm the reset.

Note:
Reset to factory defaults resets the following parameters:

- Application mode (default: 1)
- 100h burn-in mode (default: off)
- Power up state (default: on)
- Background level (default: 20%)
- IR group (default: A)
- DALI groups of all connected luminaires (OccuSwitch DALI will work in un-commissioned mode)

Tip:
The **Reset** button also clears the settings in the IRT9090 (mode, power-up state, background lighting level and IR group), if stored. To clear the settings only from the remote, cover the remote's IR LED while pressing the green **Send** button.

4.4. Movement test

To check that the OccuSwitch DALI system is correctly installed and commissioned, the OccuSwitch DALI system can be set into the movement, or walk, test mode. In this movement test mode, all actions of the OccuSwitch DALI run at a high speed (10 times faster than normal), movement detection period is set to 30 seconds (independent of potentiometer settings), and daylight dependent switching and daylight override are disabled.

The movement test mode can be started and stopped using the IRT9090 tool.

Entering the Movement test mode

1. Point the remote towards the OccuSwitch DALI and press **Test** to enter the movement test mode.

The LEDs on the OccuSwitch DALI will start running a color sequence.

Leaving the movement test mode

1. Point the remote towards the OccuSwitch DALI and press **Test** to leave the movement test mode.

The luminaires will flash twice to confirm the end of movement test mode.

The OccuSwitch DALI returns to normal operation.

Note:

After one hour of being in the movement test mode, the OccuSwitch DALI will automatically return to normal operation. In this case it also flashes the luminaires twice.

5. OccuSwitch DALI BMS (LRM2090 and LRM2092)

5.1. Introduction

The OccuSwitch DALI BMS (OSD BMS) can be connected to a Building Management System (BMS) in three ways:

- Via an universal DALI controller, available for almost any BMS system
- Via an universal DALI gateway, available for most BMS systems
- Via a specific gateway (Loytec Lon and BACnet, Philips KNX and Dynet)

5.2. Using a universal DALI controller

This method works with all DALI controllers, designed to be used with DALI drivers (aka drivers). The OSD is connected via the X-port to the controller. The DALI network formed by the OSD and the luminaires function separately from this connection.

The OSD will be seen as a driver (most controllers will detect the device is not a standard driver and report so, but it will work as a driver).
This means that all standard DALI commands (known as part 102 of the DALI standard) will work with the OSD. If you select a certain output level (regardless of the method you select to do so) all luminaires connected to the OSD will react. The OSD will operate as one, since the OSD only uses 1 DALI address. So all OSD channels (window corridor side for instance) will react in the same way. Furthermore the automated daylight control is disabled while the occupancy control is NOT. If a command is given the occupancy timer is triggered. If the area is vacated lights will be switched off after the timer expirers. If you want the lights to stay on (or off) you must repeat the DALI command used with a shorter interval than the time set in the timer.

All status reports will reflect the actual status of the luminaires “behind” the OSD. However the OSD can only report a single status, so if one lamp (connected to the OSD) fails, the OSD will report this, and not that others are still ok.

5.2.1. Pitfalls and exceptions

- If you select the first scene (scene1) the OSD will not react, instead it will enable the automated mode, including daylight control
- Most DALI controllers expect to be a master on the DALI bus. Many of them do not read the actual light output as given by the DALI device (in this case the OSD), but they rely on the value in the last command given. So a read-back of the value will not report the actual status of the OSD. A gateway will do this correctly
- The OSD will report the average output value (so if 2 luminaires are on 55% and one on 100% it will report 70%). Older version (the /00) will report the window side value.
- Some controller work in a different way than you expect. For instance a scene; a controller could store the scene information itself. Instead of sending out a scene it will send direct arc power (so output) values to the OSD. It might be impossible to send a DALI scene1 command to set the OSD into automated mode. Some controllers are not fully DALI compatible. This is not noted when used with drivers, but might affect the functioning of the OSD

5.2.2. Shared Occupancy Control

It is possible to share the occupancy signal amongst the controllers. Each controller can be assigned to a DALI group. If occupancy sharing is enabled (please refer to your Philips representative for more information how to enable this feature and the tool you require for this) each OSD will send

occupancy info to its group members. This is very useful for open plan offices. Now an open plan can be configured easily as one space.
The OSD recognizes if the occupancy signal is from its own sensor, or from a neighboring one. Put into mode 9 it will switch lights on at nominal level if the OSD "sees" movement itself or to 30% or 50% if the signal was from the neighbor thus an ideal regime with optimal savings in an open plan. Areas in use will receive full lighting, unused areas will go to a lower light level, saving energy, but preventing dark areas in the open plan office.
The OSD uses DALI grouping for this feature.

Note: this function will only work in combination with a DALI controller if this controller support multi master mode (aka DALI part 103, not released yet). Please ask and test before you specify this function.

5.3. Using a universal DALI gateway

This method works with all DALI gateways, designed to be used with DALI networks. The OSD is connected via the X-port to the controller. The DALI network formed by the OSD and the luminaires function separately from this connection. All limitations seen by the DALI controller are not present with the gateway.

The OSD will be seen as a driver (most controllers will detect the device is not a standard driver and report so, but it will work as a driver). Some gateways will detect the OSD as sensor as well.
This means that all standard DALI commands (known as part 102 of the DALI standard) will work with the OSD. If you select a certain output level (regardless of the method you select to do so) all luminaires connected to the OSD will react. The OSD will operate as one, since the OSD only uses 1 DALI address. So all OSD channels (window corridor side for instance) will react in the same way. Furthermore the automated daylight control is disabled. The occupancy control is NOT. If a command is given the occupancy timer is triggered. If the area is vacated lights will be switched off after the timer expirers. If you want the lights to stay on (or off) you must repeat the DALI command used with a shorter interval than the time set in the timer.

All status reports will reflect the actual status of the luminaires "behind" the OSD. However the OSD can only report a single status, so if one lamp (connected to the OSD) fails, the OSD will report this, and not that others are still ok.

5.3.1. Pitfalls and exceptions

- If you select the first scene (scene1) the OSD will not react, instead it will enable the automated mode, including daylight control
- Most The OSD will report the average output value (so if 2 luminaires are on 55% and one on 100% it will report 70%). Older version (the /00) will report the window side value.

5.3.2. Shared Occupancy Control

It is possible to share the occupancy signal amongst the controllers. Each controller can be assigned to a DALI group. If occupancy sharing is enabled (please refer to your Philips representative for more information how to enable this feature and the tool you require for this) each OSD will send occupancy info to its group members. This is very useful for open plan offices. Now an open plan can be configured easily as one space.
The OSD recognizes if the occupancy signal is from its own sensor, or from a neighboring one. Put into mode 9 it will switch lights on at nominal level if the OSD “sees” movement itself or to 30% or 50% if the signal was from the neighbor thus an ideal regime with optimal savings in an open plan. Areas in use will receive full lighting, unused areas will go to a lower light level, saving energy, but preventing dark areas in the open plan office.
The OSD uses DALI grouping for this feature.
This function will also enable corridor linking. This ensures that sections will be lit (optional to a lower level when not in use by itself) if other sections are still occupied. The main application area is, as the name suggests, corridors.

5.4. Using the Loytec DALI gateway

All the functions mentioned above gateway are possible, but the Loytec L-DALI supports specific OSD features. It supports these functions to both LON and BACnet.

5.4.1. Energy measurement

The combination of the Loytec L-DALI gateway and OSD gives a simple energy measurement system. Measurements and calculations are done automatically and without commissioning. You only need to fill in the power of the luminaires connected to a OSD and the system does the rest.

Note: this system assumes that all luminaire in the section of the gateway are off the same type and power, which will be the case in an office.

5.4.2. Occupancy signal

The gateway will translate the occupancy control signal as used between the OSD units itself to the BMS system. In this way the occupancy sensor of the OSD can be used to control HVAC, sun blinds, security, etc. For the LON interface this is done with the standard LONmark profile for occupancy sensors. For BACnet the object is described in the usual way by the object description in the gateway.
Up to 16 groups can be used.

5.4.3. How to use the combination of OccuSwitch DALI and gateways?

This part of the manual is designed for engineers with sufficient knowledge on DALI, gateways, and the communication protocol used in the BMS system (either BACnet, KNX or LON(mark).

5.4.4. Cascading DALI network

The OccuSwitch DALI (OSD) uses 2 DALI networks, one for the luminaires (fittings) plus sensors and push button interfaces, the other to link the OSDs to each other and via a gateway to the BMS. These networks have no logic connection and work independent from each other.

Although logical separated, the two networks are electrically connected to each other. This means that the DALI network to the gateway is connected to the luminaires as well. Most drivers in the luminaires only offer basic isolation. Therefore all DALI wiring must be treated as mains wiring, with the right isolation in place. One advantage; you are allowed to use the DALI and mains wiring in one cable, cable duct, junction box, etc. The DALI signal is ELV (or PELV) but not S(ave)ELV.

Advantages of a cascading DALI network
One of the main advantages of the cascading network is the separation of the control and management information. Per control circuit one DALI network is used. DALI is rather slow, and will only support up to 4 control circuits before the communication with clutter. You need to take care on this in a traditional DALI system. With this solution this will never happen.

5.4.5. OccuSwitch DALI

Install the OccuSwitch DALI (OSD) as indicated in the OSD documentation as usual (zie OSD documentation). The DA connection should be used for the luminaires, the X connection is for the interlinking and the gateway.

Commission the OSD as needed, set the desired mode, calibrate the light sensor and commission the luminaires to the right function.
Optional you can already set the DALI group the OSD should work in. this is a very convenient method. If you have a plan, select the OSD and set its group address. You can do this from the gateway, but the gateway will use a search method, it will select one of the OSDs and ask you to give the corresponding address. This will lead you at random through the floor or building.

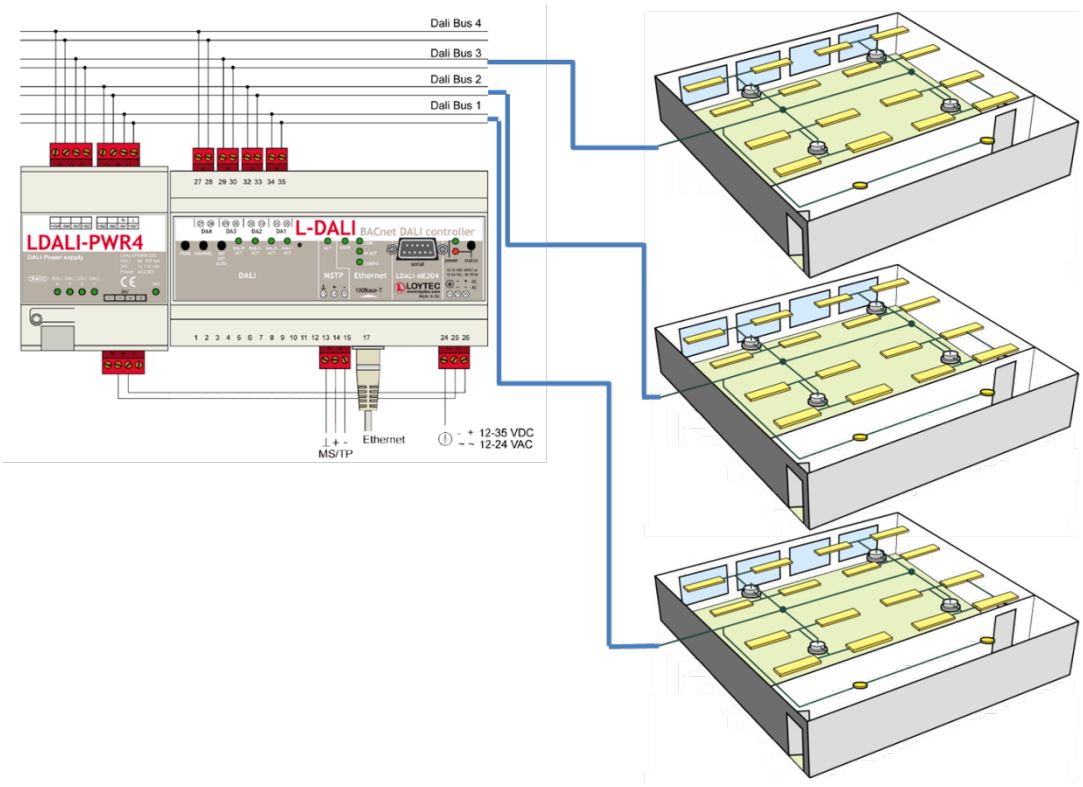
When the OSD is commissioned it can be connected to the gateway.

Disabling DALI system failure

The OSD is working according to the DALI (#101 and #102) specification. This means that the OSD will react if there is no DALI power on the X port. The luminaires (mounted on the DA side) will be set to 100% (the default system failure level). This is normally a good measure, no DALI power means that the controller or the bus channel is failing, the safest action than is to switch on the lights. During installation however this is not very convenient, since the gateway will most likely be installed much later. Therefore the OSD will disregard a system failure as long as it does not detect DALI power on the X port.
If you had DALI power connected to the X port, but disconnected it and you want the OSD to work normally again, just remove mains power for 5 seconds. The OSD will function normally again.

5.4.6. The gateway

The diagram shows the OSD's connected to the gateway (in this case the 4 channel LDALI BACnet version).



The LDALI gateways will recognize the OSD unit both as sensor as well as driver (DALI slave).
Up to 16 sensors will be recognized. All OSD sensors will function, and are divided into 16 groups.
The gateway is not capable of recognizing individual sensors.

The web interface allows you to give each OSD a short address; this will not influence the Group setting made earlier. You can, of course, change group addressing to your needs.
Depending on your needs you can use the group or short address methods to change the light settings.

5.5. How does the OSD react to DALI commands?

The table below shows the reaction of the OSD and the luminaires behind it on the most common DALI commands in comparison with a “normal” driver.

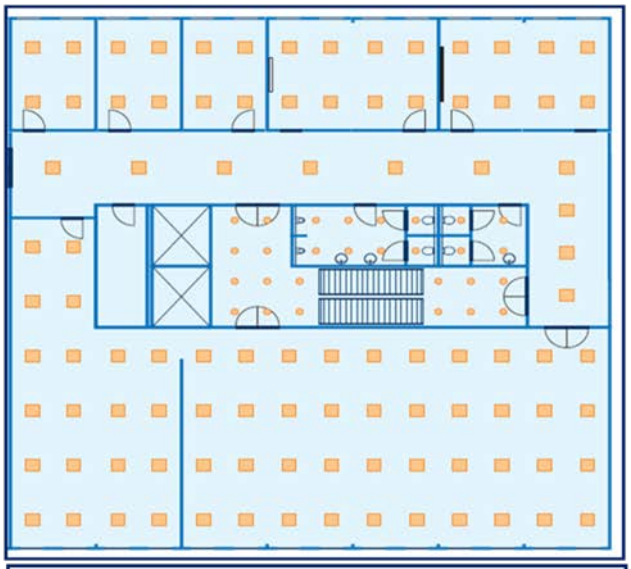
DALI command	Effect on normal driver	Effect OSD
Direct ARC	Driver will set output level accordingly*.	All drivers connected to the OSD will be set the output level*. Daylight regulation is suspended.
Recall scene 0 (first scene)	The driver will set the output level as defined in scene 0.	Automatic mode will be enabled. The system will NOT go to the output level defined in scene 0, but to the light level set during commissioning.
Recall scene 1..15	The driver will set the output level as defined in the scene*.	The driver will set the output level as defined in the scene*. Daylight regulation is suspended.
SET DTR as scene	The value in DTR will be stored as a scene	The value in DTR will be stored as a scene, also for scene 0!

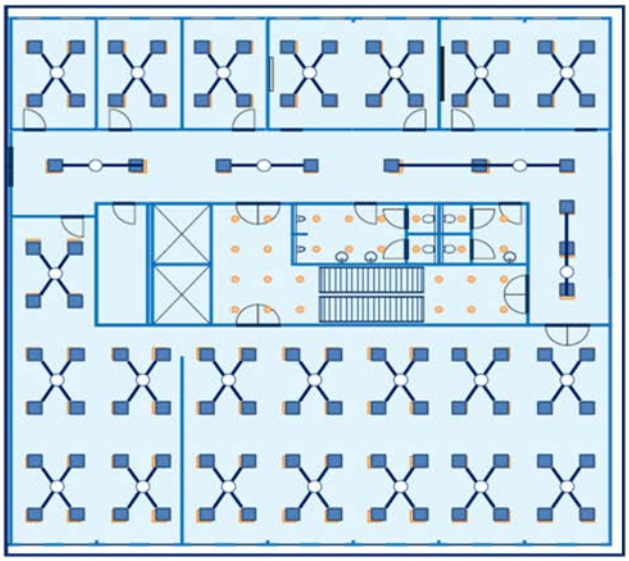
* All commands will use fading, minimum and maximum level according to previous settings.

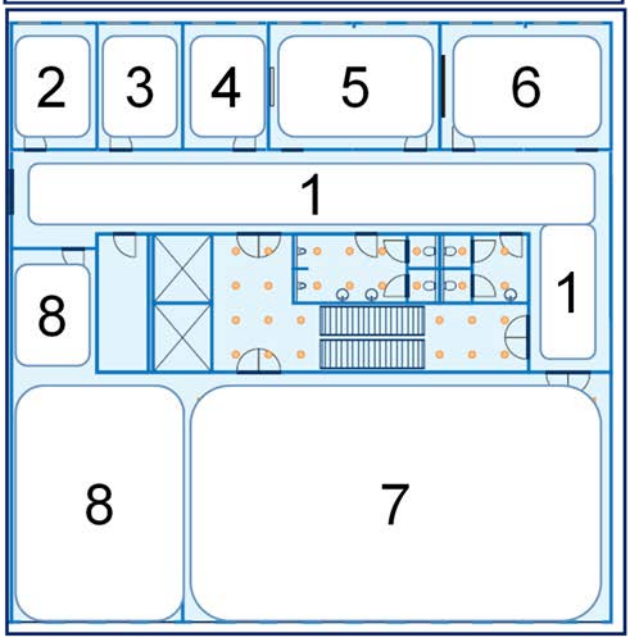
All DALI commands given to the OSD that affect the output level will start the occupancy timer. A single DALI command will set the output level only for a limited period (the occupancy timer period) if an area is not occupied. Lights will switch off after this period (or go to background level if set). You need to repeat the DALI command to keep lights on a certain level. The repetition time must be shorter than the occupancy timer period set in the OSD.

5.6. DALI grouping and occupancy control

The OSD uses DALI group addressing for occupancy control. This is the DALI group address of the unit itself (so on the X interface).
If enabled, the OSD will send a occpuancy messages over the DALI network whenever the movement detector is triggered. These messages contain the DALI group address of the unit (you can only use 1 of the 16 groups, except for corridors). The OSD will act on a message with the same group address it belongs to itself. It will ignore other occupancy messages.
The maps below show a typical office application, with on the right hand side the installation of the OSD units. Below it shows the group addresses.





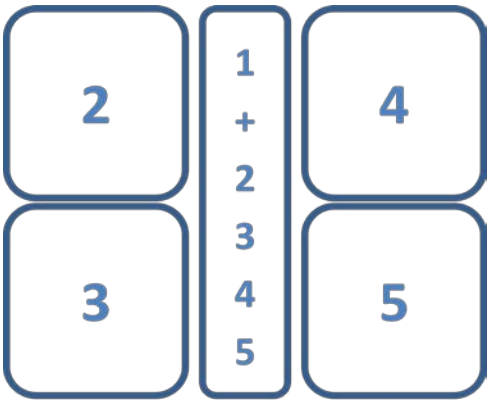


Each group shares occupancy.
Take for instance group 5. It exists of 2 OSD units. When one the units detects movement a message with group 5 will be send. The other unit will react as well and both units will switch (or keep) the lights on at nominal level.

In Group 7 this might be different. Here will the unit detecting occupancy switch the lights to full, but all the other units in the group, detecting nobody will, set the light level to, say, 30%. This will result in an overall illumination, but only at maximum where required.

In total 64 OSD units can be connected to each other, using 16 groups. The gateway will also only recognize 16 sensor groups. It is impossible to read an individual sensor

5.7. Corridors



For corridors several options are possible. You can use the same occupancy sharing as described before. But if the corridor mode is used (mode 6), the OSD can “listen” to several (or all 16) groups. This can be used for corridor linking, keeping the lights on in the corridor if one of the adjacent rooms or areas is still occupied. The first (lowest number) group must be used for the corridor itself. In this example the OSD units in the corridor have group number 1, but groups 2 till 4 are added.
Please note that this only works in corridor mode 6!

5.8. Grouping without gateway

It is possible to use occupancy sharing between OSD units without gateway (or controller). You need to use a DALI power supply to provide system power on the DALI (X-port) bus.

5.9. Energy measurement

The OSD has a special feature to deduct the amount of energy that is being used by the lighting system. The OSD will calculate the average value if it has been commissioned and luminaires have been assigned to groups. The OSD will take the number of luminaires and the current setting for this average. So, for example one luminaire at 100% and two at 40% will result in an average of 60%. This is then used for the actual level (at the DALI interface).

Furthermore the OSD will calculate the energy that is used and store this internally. The gateways are able to gather this information. Usually the luminaire type in an office is same everywhere. Simply fill in the system power of this luminaire in the gateway and it will calculate the right energy level.

5.10. How to commission a OSD with a network

As described before, the OSD units are grouped together, share occupancy and send per group occupancy information to the gateway.

5.11. Command list

OSD LRM2090/20 DALI commands		**Executed for all OSD slave luminaires the same**		
			Executed	
Hex #	**Command**			**Other**
—	Direct arc	x		Will not clip to min level
0	Extinguish the lamp without fading	x		
1	Dim up 200 ms using the selected fade rate	x		
2	Dim down 200 ms using the selected fade rate	x		
3	Set the actual arc power level one step higher without fading. If lamp was Off it will not ignite	x		
4	Set the actual arc power level one step lower without fading. If lamp was at its minimum level it will not switch Off	x		
5	Set the actual arc power level to the maximum value	x		
6	Set the actual arc power level to the minimum value	x		
7	Set the actual arc power level one step lower without fading. If the lamp was at its minimum level it will switch Off	x		
8	Set the actual arc power level one step higher without fading. If the lamp was Off it will be ignited	x		
10+	Scene Set the light level to the value stored for the selected scene	x		Scene 0 will restore automatic mode and power up level (= calibrated level)
20	Reset the parameters to default settings	x	x	This command restores the default settings except for the power on level (= daylight depending control calibration)
21	Store the current light level in the DTR		x	
2A	Store the value in the DTR as the maximum level		x	
2B	Store the value in the DTR as the minimum level		x	
2C	Store the value in the DTR as the system failure level		x	
2D	Store the value in the DTR as the power on level		x	Is accepted, has no effect
2E	Store the value in the DTR as the fade time		x	

2F	Store the value in the DTR as the fade rate		x	
40+	Scene Store the value in the DTR as the selected scene		x	
50+	Scene Remove the selected scene from the slave unit		x	Except for scene 0
60+	Group Add the slave unit to the selected group		x	
70+	Group Remove the slave unit from the selected group		x	
80	Store the value in the DTR as a short address		x	
90	Returns the status of the slave as **XX XX**		x	
91	Check if the slave is working **YES/NO**		x	
92	Check if there is a lamp failure **YES/NO**		x	
93	Check if the lamp is operating **YES/NO**		x	
94	Check if the slave has received a level out of limit **YES/NO**		x	
95	Check if the slave is in reset state **YES/NO**		x	
96	Check if the slave is missing a short address **YES/NO**		x	
97	Returns the version number as **XX XX**		x	
98	Returns the content of the DTR as **XX XX**		x	
99	Returns the device type as **XX XX**		x	Answer is 1
9A	Returns the physical minimum level as **XX XX**		x	1% is NOT related to DALI drivers connected to OSD
9B	Check if the slave is in power failure mode **YES/NO**		x	
A0	Returns the current light level as **XX XX**		x	Returns value from window side
A1	Returns the maximum allowed light level as **XX XX**		x	
A2	Returns the minimum allowed light level as **XX XX**		x	
A3	Return the power up level as **XX XX**		x	Will be 254, no meaning
A4	Returns the system failure level as **XX XX**		x	
A5	Returns the fade time as **X** and the fade rate as **Y XY**		x	

B0+	Scene Returns the light level **XX** for the selected scene **XX**		x	
C0	Returns a bit pattern **XX** indicating which group (0-7) the slave belongs to **XX**		x	
C1	Returns a bit pattern **XX** indicating which group (8-15) the slave belongs to **XX**		x	
C2	Returns the high bits of the random address as **HH HH**		x	
C3	Return the middle bits of the random address as **MM MM**		x	
C4	Returns the lower bits of the random address as **LL LL**		x	
A1 00	All special mode processes shall be terminated		x	
A3 XX	Store value **XX** in the DTR		x	
A5 XX	Initialize addressing commands for slaves with address **XX**		x	
A7 00	Generate a new random address		x	
A9 00	Compare the random address with the search address		x	
AB 00	Withdraw from the compare process		x	
B1 HH	Store value **HH** as the high bits of the search address		x	
B3 MM	Store value **MM** as the middle bits of the search address		x	
B5 LL	Store value **LL** as the lower bits of the search address		x	
B7 XX	Program the selected slave with short address **XX**		x	
B9 XX	Check if the selected slave has short address **XX YES/NO**		x	
BB 00	The selected slave returns its short address **XX XX**		x	
BD 00	Go into physical selection mode —		x	Uses OSD push button

6. Technical Specifications

6.1. LED feedback

The OccuSwitch DALI provides feedback through different blinking patterns of the LED indicator.

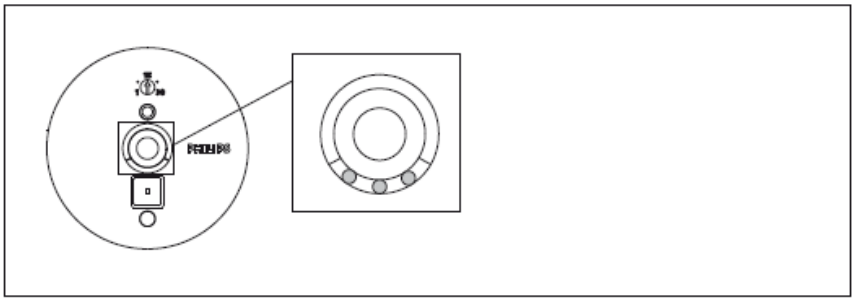


Figure 14: LED indicators of the OccuSwitch DALI

The following table shows an overview of the possible LED indications.

Blinking Pattern	Color	Cause
Irregular	Red	Motion is detected or IR command is received, and the window light output is above 70%.
Irregular	Yellow	Motion is detected or IR command is received, and the window light output is between 40% and 70%.
Irregular	Green	Motion is detected or IR command is received, and the window light output is below 40%.
Cycle (0.5 s per color)	Green – Yellow – Red	Movement test mode is activated.
Three short blinks (within 0.5 s)	All (Red, Green and Yellow)	A parallel link event is detected during movement test mode. This only shows once for each parallel link event.
Long – short (1.5 s - 0.5 s)	Yellow – Green	Manual set-point calibration by pushbutton is in progress.
Long – short (1.5 s - 0.5 s)	Red – Green	Automatic set-point calibration by pushbutton is in progress.
Long – short (1.5 s - 0.5 s)	Green – Red	DALI addressing is activated with an IR remote control.
Continuous color	Red	• An external short-circuit is present on one or both DALI outputs, • The parallel link is not correctly connected, • There are two OccuSwitch DALI on the same DALI line.
Continuous color	Yellow	An internal error has occurred.
Continuous color	Green	Burn-in mode is enabled by IR, the window light output has not passed the 100 hours yet and at least one of the light outputs is at 100%.
Very fast blinking	Any	An infrared interference has occurred. Too many IR remote controls used at the same time or too much infrared light.

6.2. Settings overview

This section gives an overview of the OccuSwitch DALI parameters. Separate tables are given for mode-dependent and mode-independent parameters. These tables are only to be used by expert level users, please contact your Philips representative.

Table 11: Mode-dependent parameters

		Cell office	Open plan	Class room	Cell office (no motion detection)	Open plan (no motion detection)	Corridor	Restroom	Meeting room	Open plan with parallel link	Custom (3)
	Mode number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Occupancy mode	disabled				X	X					
	Manual on – auto off			X					X		
	Auto on – auto off	X	X				X	X		X	
Parallel Link Application	Background lighting									X	
	Local occupancy	X	X	X	X (1)	X (1)	X	X	X		
Daylight override	disable							X	X		
	Window only	X	X	X (1)	X (1)	X (1)				X	
	Window + corridor						X				
Daylight dependent regulation	disable							X			
	enable	X	X	X	X	X	X		X	X	
Daylight dependant switching	disable							X			
	Window only	X	X		X	X			X	X	
	Window + corridor			X			X				
Smart timer	0 min							X			
	5 min										
	10 min	X	X	X	X	X	X		X	X	
	15 min										
Background period timer	0 min	X		X	X	X			X	X	
	15 min							X (2)			
	30 min										
	60 min						X				
	90 min										
	120 min		X								
	150 min										
	infinite										

1 These settings are not relevant in this mode, but do have this value
2 In mode 7 the background timer only applies to the portal luminaires.
3 The custom mode can only be selected by changing a parameter. The OccuSwitch DALI then switches automatically to mode 10, and copies all other parameters to mode 10.

Table 12: Mode-independent parameters

Parameter	**Range**
Power-up state*	Lights OFF, Lights ON (default)
Background level*l	Min. 10% 20% (default) 30% 40% 50% 60% 70%
Mode setting*	1 (default), 2, 3, 4, 5, 6, 7, 8, 9, 10
Infrared group*	A (default), B, C, D, E, F, G
Fade time	0.7 (default), 1, 1.4, 2, 2.8, 4, 5.7, 8, 11.3, 16, 22.6, 32, 45.3, 64 seconds
Burn-in mode*	Enabled Disabled (default)
Motion detect timer**	Potentiometer setting, 70 seconds, 5, 10, 15, 20, 25, 30, 35 minutes Default: potentiometer setting
Light sensor correction**	Disabled, -40%, -30%, -20% (default), -10%, 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%
Feedback LED**	Enabled (default) Disabled

* Can be changed with the IRT9090 extended IR programming tool

** Cannot be set by a user, please contact your Philips representative.

7. FAQ

Q: The LED indicators of the OccuSwitch DALI constantly show red?
For an explanation of the LED indicators, see section 6.1.

Q: The LED indicators are continuously blinking?
For an explanation of the LED indicators see section 6.1.

Q: All luminaires are at the same light level and there is no daylight regulation?
There may be too many luminaires connected to the OccuSwitch DALI. Disconnect all but one Luminaire to see if daylight regulation functions with one luminaire connected.

Q: All luminaires have a constant light level of 100% (emergency mode)?

The possible causes are:

- The DALI line may be in short-circuit,
- There may be two OccuSwitch DALI on the same DALI line,
- There are too many drivers on one DALI output,
- The DALI input line is not powered.